Attachment 1
Notice of Proposed Rulemaking

DRAFT Multiple Discharger Variance for Mercury in the Willamette Basin

September 2019

Water Quality Standards
700 NE Multnomah St
Suite 600
Portland, OR 97232
Phone: 503-229-5050
800-452-4011
Fax: 503-229-6762
Contact: Aron Borok

www.oregon.gov/DEQ

DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water

Attachment 1
Notice of Proposed Rulemaking

This report prepared by:
Debra Sturdevant and Aron Borok, Water Quality Standards and Assessment
Oregon Department of Environmental Quality
700 NE Multnomah Street, Suite 600
Portland, OR 97232
1-800-452-4011
[www oregon gov/deq](http://www.oregon.gov/deq)

Contact: Aron
Borok 503-
229-5050
Debra Sturdevant
503-229-6691

DEQ can provide documents in an alternate format or in a language other than English upon request. Call DEQ at 800-452-4011 or email [deqinfo@deq state.or.us](mailto:deqinfo@deq.state.or.us)

Table of Contents

List of Tables

List of Figures

1. Introduction and Background

A variance is a regulatory tool under the Clean Water Act to address circumstances in which a water quality standard is not currently attainable, but it is possible to make incremental progress toward meeting the standard. A variance is a temporary designated use and criterion for a specific pollutant that applies to a specific discharger or dischargers or waterbody. Federal rules allow variances based on one of seven factors. A variance is a transparent tool to ensure dischargers make incremental progress towards achieving the water quality standard.

In cases where multiple dischargers cannot attain water quality-based effluent limits for the same pollutant and due to the same or similar reasons, DEQ may develop a multiple discharger variance. A MDV is a time limited water quality standard that provides a streamlined process for qualified dischargers to apply for and obtain a variance. Once the Environmental Protection Agency approves the MDV, DEQ can issue permits for eligible facilities under the MDV with no additional water quality standards action.

DEQ is developing an MDV for mercury in the Willamette Basin for individual NPDES wastewater dischargers. These dischargers cannot currently meet mercury WQBELs because human-caused sources of mercury prevent attainment of the human health water quality criterion for mercury and removing the mercury through treatment would cause more environmental damage than removing it through source control. This document describes DEQ's justification for the MDV, variance requirements and procedures for issuing permits with variance-related conditions.

(b) (5)

This document serves multiple purposes:

1. It supports DEQ's proposed rule amendments to the Environmental Quality Commission for adoption of the MDV and amendments to the state variance rule.
2. It serves as an explanation of the MDV and variance rule amendments to the public to support DEQ's public comment process.
3. It will serve as the justification for the MDV and rule amendments for EPA approval under the Clean Water Act.
4. It will provide information to the public and the regulated community regarding how DEQ plans to implement the MDV.

1.1 Mercury in Fish and the Environment

The following information is an excerpt from DEQ's *Draft* 2019 Mercury Total Maximum Daily Load for the Willamette Basin (ODEQ 2019). Additional information on mercury and the methylation process is found in the TMDL document as well as EPA's 2001 methylmercury criteria documents[1].

Mercury in higher trophic level fish is present largely as methylmercury, which is a potent neurotoxin in humans and other vertebrates. Mercury is a pollutant of global concern due to its widespread distribution in the environment and accumulation in aquatic biota. Most releases of mercury into the environment are

[1] https://www.epa.gov/wqc/human-health-criteria-methylmercury

to the atmosphere in an inorganic form; however, almost all human exposure to mercury is to an organic form, methylmercury, through the consumption of contaminated fish (Eagles-Smith, et al., 2018; Munthe, et al., 2007). Mercury released into the atmosphere has a long atmospheric lifetime (~6-12 months) which allows for its widespread distribution prior to deposition (Lindberg, et al., 2007; Schroeder & Munthe, 1998). As a result, elevated levels of methylmercury in fish tissue occur even in remote ecosystems (Chetelat, et al., 2015; Fitzgerald, et al., 1998; Trip & Allan, 2000). Most of the mercury in fish originates from dietary exposure, with minimal direct uptake by fish from the water (Hall, Bodaly, Fudge, Rudd, & Rosenberg, 1997). Therefore, differences in trophic position, foraging behavior, and diet can have a large impact on how much mercury is present in a given fish species (Driscoll, et al., 2007; Eagles-Smith, et al., 2016).

1.2 Oregon's Mercury Water Quality Standard and its Application in the Willamette Basin

In 2011, Oregon adopted a fish tissue criterion for methylmercury based on a fish consumption rate of 175 grams/day to protect the health of high consumers of marine and freshwater fish and other seafood. The current human health criterion is 0.04 mg/kg methylmercury in the fish tissue. DEQ revised all the state's human health criteria based on the new fish consumption rate at that time. The EQC and interested stakeholders understood that meeting the methylmercury criterion based on this consumption rate might not be immediately attainable in some waters and that variance might be an appropriate tool for permitted facilities.

(b) (5) [redacted]

The 2006 TMDL development generated a bio-accumulation factor for the Willamette River Basin for several species of fish. The BAF is a value that represents the relationship between concentrations of pollutants in water and the pollution concentration in a species of concern, and thus was used to convert fish tissue criteria value to a water column criterion. In addition, the TMDL developed a translator to convert the dissolved methylmercury to a total mercury in water, which is the mercury parameter typically monitored and used in permit analyses. Using these procedures, the TMDL derived water column targets for total mercury based on the BAF for the most sensitive species modelled, the Northern pikeminnow (*Ptychocheilus oregonensis)*.

In 2018, during the process to revise the mercury TMDL, an EPA contractor conducted the modelling to update the water concentration value based on the methylmercury criterion of 0.04 mg/kg adopted in 2011. DEQ is updating the TMDL based on the updated water column concentration of 0.14 ng/L total mercury. DEQ also is utilizing that concentration for determining whether a discharge could cause or contribute to an exceedance of the criterion, in which case, a numerically-based effluent limit must be included in the permit. Effluent limits calculated using this water concentration value are not currently achievable due to the limitations of current technologies.

(b) (5)

1.3 Overview of variance regulations

A variance is a regulatory tool (40 CFR 131.14) to address circumstances where a designated use and associated criterion are not currently attainable, but it is possible to make progress toward meeting the criterion and the underlying designated use in the receiving water body. The federal regulations regarding variances, promulgated in 2015, are at 40 CFR 131.14. The Oregon regulations regarding variances are located at OAR 340-041-0059[2]. In addition, DEQ has published implementation procedures for variances[3]. DEQ is updating the state's rules to ensure they are consistent with federal regulations promulgated in 2015.

The need for a variance must be justified based upon one of seven factors provided in state and federal regulations. Section 2 of this document provides the rationale for the need for the MDV for mercury.

For the MDV to be effective under the Clean Water Act, the Environmental Quality Commission must grant the variance and DEQ must submit it to EPA for approval, as it does for any change to a water quality standard. The variance must list the pollutant(s) and waterbody to which the variance applies, as well as the permittees subject to the variance. This information is included in Section 1.4.

The variance also must include the requirements that apply throughout the term of the variance. These requirements must represent the highest attainable condition of the water body throughout the term of the variance. These requirements are included in the rule and summarized in Section 3 of this document. DEQ's rationale for the proposed 20-year term of the variance is also included in Section 3. If the term of the proposed variance is greater than five years, federal variance regulations require states to re-evaluate the highest attainable condition at least every five years. Section 3 includes a description of the HAC re-evaluation process.

Federal rules require that any limitations and requirements necessary to implement the variance be included as enforceable conditions of the NPDES permit for permittees subject to the variance. DEQ's process for permittees to apply for coverage under this variance and how the agency will incorporate enforceable conditions necessary to implement the variance in permits, is described in Section 4.

1.4 Overview of the Proposed Variance

The proposed MDV allows DEQ to issue permits based on a time-limited standard for methylmercury in the Willamette Basin. The variance applies only to qualifying NPDES dischargers in the Willamette Basin and only for methylmercury. The underlying methylmercury criterion continues to apply for other CWA programs, such as water quality assessment and TMDLs. The variance applies to any NDPES discharger identified in the variance who submits a qualifying application to DEQ.

Designated Use

The current designated use in the Willamette Basin that cannot be attained as demonstrated in Section 2 is fishing (fish consumption).

Pollutant

The pollutant associated with this variance is methylmercury. The human health criterion that cannot be attained is 0.04 mg/kg, as measured in the fish tissue in the Willamette River Basin. The water column concentration needed to attain the fish tissue criterion is 0.14 µg/L total mercury.

Term of the variance

The term of the MDV is 20 years. See Chapter 3 for additional information.

(b) (5)

[2] Oregon variance regulations are available at
https://secure.sos.state.or.us/oard/displayDivisionRules.action?selectedDivision=1458
[3] Oregon implementation procedures for variances are available at
http://www.oregon.gov/deq/Filtered%20Library/IMDVariance.pdf

Attachment 1
Notice of Proposed Rulemaking

Permittees and waterbodies potentially subject to the variance

As of September 2019, permittees or potential permittees subject to the variance include those listed in Table 1. Once EPA approves the MDV, any discharger must submit information required by the MDV rule in order to obtain variance coverage. Facilities not listed here which meet MDV eligibility requirements may apply for coverage under this MDV. DEQ will provide public notice and opportunity for comment before it provides coverage to any dischargers under this MDV.

(b) (5)

Permittee	Receiving Waterbody
Municipal Facilities with Advanced Wastewater Treatment	
Clean Water Services – Rock Creek STP	Tualatin River
Clean Water Services – Durham STP	Tualatin River
McMinnville Water Reclamation Facility	South Yamhill River
Major Municipal Facilities without Advanced Wastewater Treatment	
Metropolitan Wastewater Management Commission – Eugene/Springfield STP	Willamette River
Salem Willow Lake STP	Willamette River
Kellogg Creek WWTP	Willamette River
Tri-City Water Pollution Control Plant	Willamette River
Clean Water Services – Forest Grove STP	Tualatin River
City of Portland – Tryon Creek WWTP	Willamette River
Albany-Millersburg Water Reclamation Facility	Willamette River
Corvallis STP	Willamette River
St Helens STP/Boise Cascade	Multnomah Channel
Canby STP	Willamette River
Oak Lodge Services Water Reclamation Facility	Willamette River
Wilsonville STP	Willamette River
Dallas STP	Rickreall Creek
Lebanon WWTP	South Santiam River
Newberg STP	Willamette River
Silverton STP	Silver Creek
Woodburn WWTP	Pudding River
Cottage Grove STP	Coast Fork Willamette River
Stayton STP	North Santiam River
Sweet Home STP	South Santiam River
Industrial Facilities	
Tri-City Service District – Blue Heron	Willamette River
West Linn Paper Company	Willamette River
Cascade Pacific – Halsey	Willamette River
Georgia-Pacific – Halsey	Willamette River
IP Springfield Paper Mill	McKenzie River
Westrock, Newberg Mill	Willamette River
Teledyne Wah Chang	Willamette River
Siltronic Corporation	Willamette River

Requirements of the variance

The requirements of the variance, which will become permit conditions, include:

1. An interim effluent condition based on the level currently achievable (see Section 3).
2. Implementation of a Mercury Minimization Plan (see Section 3).
3. Monitoring and reporting requirements as described in Chapter 4 below.

4. Re-evaluation of the HAC every five years.

2. The Need for the Variance

In order to grant a variance to a discharger, DEQ must find that it is not feasible to attain the designated use during the term of the variance because the criterion established to support the designated use is not currently attainable. Federal regulations at 40 CFR 131.14(b)(2)(i)(A) specify the factors that can be used to justify the need for a variance. DEQ is justifying the mercury MDV using Factor 3, "human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than leave in place." This section of the report summarizes the information that supports the need for the multiple discharger variance for mercury in the Willamette Basin. Section 2.1 details why human-caused conditions or sources of pollution prevent current attainment of the use and cannot be remedied during the variance term, highlighting the ongoing deposition of global airborne mercury in Oregon. Section 2.2 details why NPDES permittees cannot feasibly achieve WQBELs that would attain the methylmercury criterion during the term of the variance.

2.1 The methylmercury criterion for fish consumption is not currently attainable

The human health criterion for methylmercury is not currently attainable throughout the Willamette Basin due to atmospheric deposition of mercury in the watershed. The atmospheric deposition of mercury is a human-caused condition that cannot be remedied by NPDES dischargers or the State during the proposed 20-year term of the requested variance (Factor 3). The ubiquitous nature of the mercury levels in fish tissue and in the atmosphere in Oregon and across western North America, support this conclusion. In addition, there are geologic sources of mercury that occur in Oregon soils and water that are mostly the result of historical atmospheric deposition. These sources enter Oregon waters through surface runoff and groundwater resurfacing and cycle their way into fish. Neither these sources nor the processes by which they find their way into the waters of the Willamette Basin can be controlled by NPDES dischargers or the state during the proposed 20-year term of the variance at levels to meet Oregon's methylmercury criterion (ODEQ, 2019).

(b) (5)

The information provided below demonstrates the need for the variance based on 40 CFR 131.10(g)(3), human-caused pollution that cannot be remedied or would cause more environmental damage to correct than to leave in place. Although the designated use and associated criterion are not attainable during the term of the variance, NPDES dischargers will continue to implement mercury minimization programs that will reduce human-caused sources of mercury to achieve the greatest pollutant reductions possible. Therefore, a variance is an appropriate Clean Water Act tool for these facilities.

The following data and information support the need for the Willamette Basin mercury variance by demonstrating that the mercury criterion is not attainable during the term of the variance in the waterbody. Even without the mercury load coming from individual point sources in the Willamette, the mercury criterion is not attainable in the waterbody during the term of the variance due to sources of mercury outside the control of the dischargers and the state, which cannot be remedied during the term of the variance. Individual point source contributions of mercury will be reduced to the maximum extent feasible through the implementation of mercury minimization plans, as described in this document.

1. Data from Oregon show that fish tissue levels of methylmercury from locations across the state exceed the criterion of 0.04 mg/kg in a large majority of samples (Figures 2-1 and 2-2). The exceedances occur in remote as well as developed areas, indicating that elevated mercury in fish tissue is a ubiquitous problem across Oregon and is not solely associated with active point source discharges or urbanization.

2. The 2019 update to the Willamette Mercury TMDL has found that all individual NPDES discharges in the Willamette basin together contribute less than 1% of the total mercury load to the Willamette Basin, about 1.6 kg/year out of a total mass load of 132.0 kg/year (Figure2-3).

3. Based on modeling and other analyses, the 2019 TMDL update identified direct runoff of atmospherically deposited mercury (33%) and erosion of mercury containing sediment (43%) as the dominant contributors of mercury to the river. The 2019 TMDL technical support document estimates that 88% of the total mercury load comes from these two sources plus other nonpoint sources.

(b) (5)

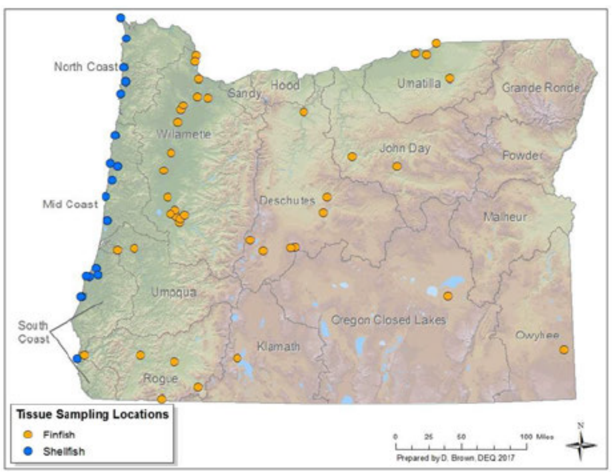


Figure 2-1. Tissue sampling sites (2008-2015).

From DEQ's Statewide Aquatic Tissue Toxics Assessment Report (ODEQ, 2017, p. 2).

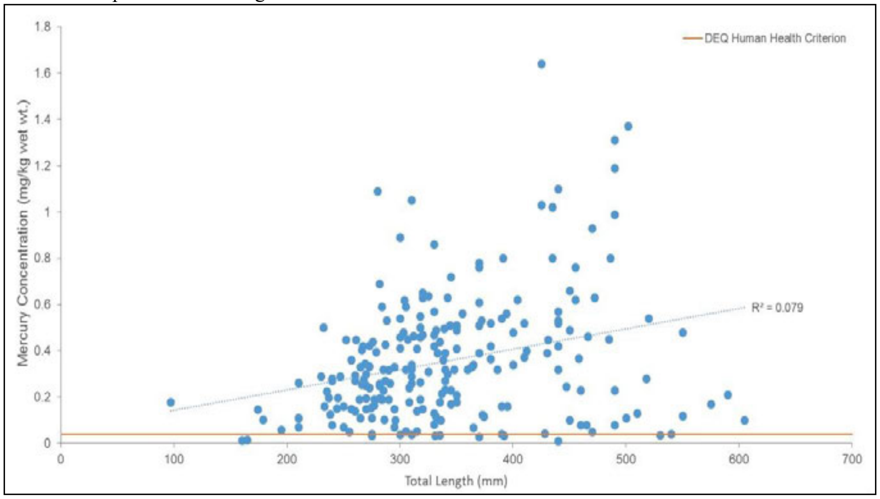


Figure 2-2. Mercury concentration (mg/kg wet weight) in skinless finfish fillets compared to total length (mm).

The orange line indicates the DEQ human health criterion for methylmercury (0.04 mg/kg fish tissue). (ODEQ, 2017, p. 13, Figure 10.)

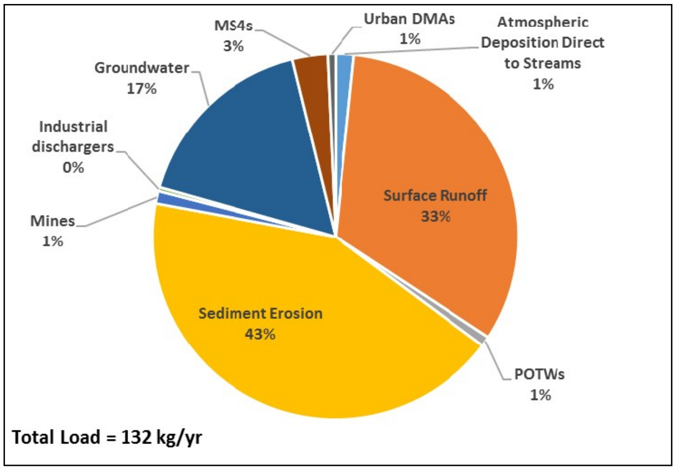


Figure 2-3. Distribution of THg Source Loads to the Stream Network (Tetra Tech, 2019)

The following information also supports the conclusion that atmospheric deposition is currently the major factor preventing the attainment of the use and that these dominant mercury sources cannot be remedied by the discharger or the state during the term of the variance.

1. Data from the Mercury Deposition Network and the scientific literature demonstrate that mercury is present in precipitation and that mercury is deposited onto Oregon waters and within watersheds (commonly referred to as "atmospheric deposition") (Figures 2-4 and 2-5).

2. Atmospheric sources of mercury deposited into waterways or onto the landscape in the Willamette Basin are primarily from sources outside of the state. On average, the amount of mercury in the atmosphere that is of purely natural origin is 13% of the total. In the terrestrial environment, this value increases to 17%. As such, greater than 80% of the mercury cycling in the environment is thought to be due to anthropogenic activities outside of the state and less than 20% from natural geologic sources (Amos, et al. 2013).

3. An 88% reduction in the total mercury load to the Willamette Basin is needed to meet the water concentration target of 0.14 ng/L total mercury. While the state's storm water and nonpoint source control programs will decrease levels of mercury associated with those activities, DEQ estimates it will take decades to implement programs to reach an 88% reduction in mercury loads to the Willamette Basin (ODEQ 2019). As a result, attaining the standard is not feasible within the proposed 20-year term of the variance, even under an aggressive program to prevent runoff and erosion of mercury from the landscape to waters of the basin.

(b) (5)

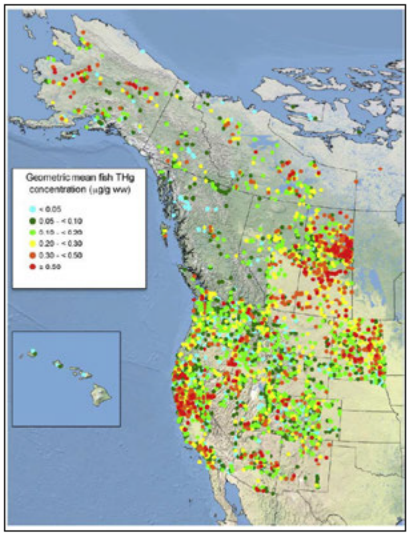


Figure 2-4. Geometric mean of fish tissue concentrations by site.

Only locations with turquoise dots would have geometric means close to the 0.04 mg/kg standard. From Eagles-Smith et al., 2016b.

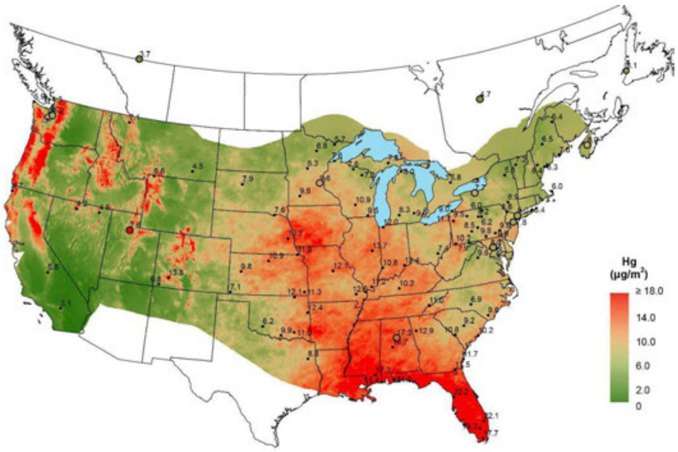


Figure 2-5. Total Mercury Wet Deposition in 2014 (Mercury Deposition Network, 2017)

DEQ expects that management practices to control erosion and rainwater runoff will reduce the movement of mercury from the land into the water. These practices are discussed in the Draft 2019 TMDL (ODEQ, 2019). The TMDL will also provide opportunities for municipal sources to investigate and implement best management practices within their jurisdiction as part of mercury minimization plans.

In summary, based on the information summarized above, DEQ concludes that Oregon's fish tissue criterion for methylmercury, and thus the fish consumption use to protect human health, is not attainable in the Willamette Basin during the term of the variance. There is sufficient data and information to demonstrate that mercury is a human-caused condition that cannot be remedied during the term of the variance to the extent needed to meet the underlying designated use and criterion in the Willamette Basin through the implementation of Clean Water Act requirements by NPDES permitted dischargers or the State. Based on the data and literature, mercury levels in the Willamette Basin result primarily from sources other than point source discharges. DEQ is addressing the broad spectrum of sources through the water quality management plan in the TMDL currently under development. DEQ estimates that the WQMP will take decades to implement in order to reach the water quality standards. While the state is implementing management practices to reduce the movement of mercury to the water, as discussed in Section 3.3, such practices would not result in attaining the designated use and criteria within the 20-year variance. These findings justify the need for a variance for the Willamette Basin, which is consistent with 40 CFR 131.10(g)(3).

2.2 Water Quality Based Effluent Limits for mercury are not achievable

There are no technology-based effluent limits or effluent limitations guidelines for mercury. Therefore, NPDES permit limits for mercury are evaluated based on the water quality criterion. Because total mercury levels in the Willamette River basin exceed the water concentration needed to meet the fish tissue-based methylmercury criterion, dischargers would be required to achieve an effluent concentration equal to the water concentration target of 0.14 ng/L before the effluent is discharged to the receiving water. Current treatment technology can reliably attain concentrations less than 20 ng/L. Treatment achieving these levels is typically through the removal of solids which have mercury adsorbed to them Treatment achieving these levels is typically through the removal of solids which have mercury adsorbed to them. Thus, mercury removal is an ancillary benefit of wastewater treatment and effluent concentrations vary significantly, even when influent concentrations are similar. Moreover, any removed mercury from treatment is likely to end up into biosolids, which is then disposed of through land application or to landfills, where it can re-enter the environment. DEQ also examined other treatment technologies and determined there are currently no feasible treatment technologies that could feasibly reduce mercury levels enough to achieve an effluent concentration of 0.14 ng/L.

2.2.1 Mercury Levels Currently Achieved by Secondary and Advanced Wastewater Treatment Plants

The information in this section demonstrates that current wastewater treatment technology, while removing 90% or more of mercury from influent, consistently achieves *average* mercury concentrations ranging from 1-15 ng/L. However, because mercury removal is an ancillary benefit of treatment, mercury concentrations are so small, and mercury can enter into a collection system in unexpected ways, effluent concentrations vary significantly, even in effluent from one discharger and under similar conditions.

In 2005, California performed a study looking at methylmercury removal from NPDES permitted dischargers in the Sacramento River Delta (California EPA, 2010). California required dischargers to collect and report on methylmercury influent and effluent data over twelve months in 2004 and 2005. A subset of these facilities also reported total mercury effluent data. The facilities were categorized as either secondary or tertiary treatment plants. The median of the average annual total mercury effluent concentrations was 7.4 ng/L in secondary treatment plants (n=27) and ranged from 3.1-21.5 ng/L (Figure 2-6). In tertiary treatment plants (n=22), the median average annual concentration was 3.3 ng/L and ranged from 0.8 – 11.6 ng/L.

DEQ also compiled and analyzed mercury levels from 2016 data provided by municipal dischargers in Oregon (Figure 2-7). In this case, DEQ categorized each system as secondary or advanced. Advanced systems included additional filtration or treatment after secondary treatment. The median average annual total mercury effluent concentration was 2.9 ng/L for secondary treatment plants (n=11) and ranged from 1.2 to 8.3 ng/L. In advanced treatment plants (i.e , those employing nutrient removal, tertiary or other post-secondary treatment filtration, or both) (n=8), the median annual average concentration was 1.7 ng/L and ranged from 1 1 to 3.0 ng/L.

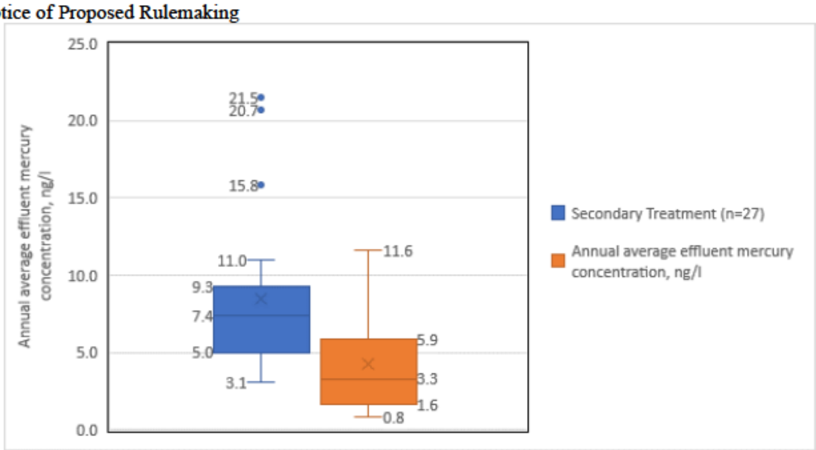


Figure 2-6. Average Total Mercury Effluent Concentration, Sacramento Delta WWTPs, 2004-2005. (California EPA, 2010)

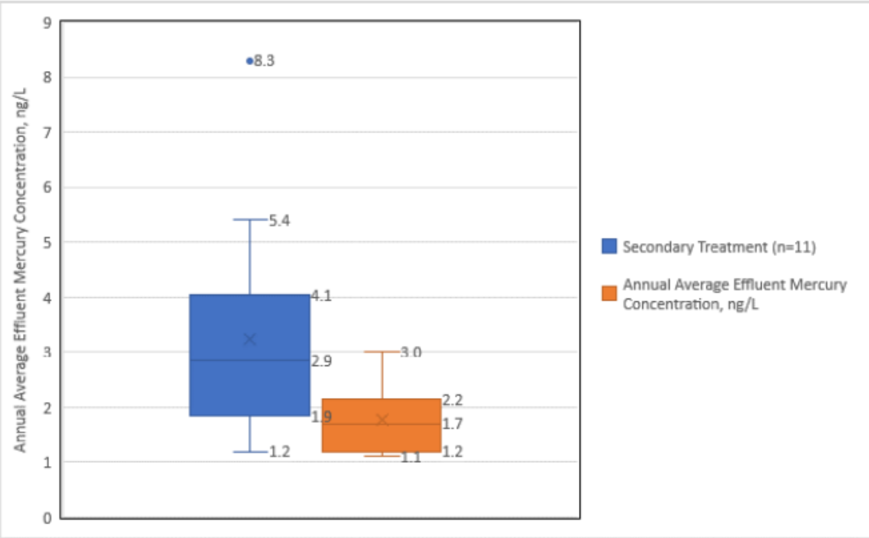


Figure 2-7. Average Total Mercury Effluent Concentrations, Oregon pre-treatment WWTPs, 2016

Note: The Oregon wastewater treatment facilities included in the advance treatment group (n=8) for this graphic include: Rock Creek and Durham operated by Clean Water Services, McMinnville, Wilsonville, Albany, Kellogg Creek, Newberg and Tri-cities. Only a portion of the Tri-cities WWTP flow is filtered

(b) (5)

after secondary treatment; however, the average mercury concentration in the effluent in 2016 was 1.6 ng/L, which is comparable to other advanced treatment systems.

This information, along with Wisconsin data presented in Section 3, indicate that secondary and advanced treatment achieve a range of mercury concentrations and these concentrations overlap. Moreover, as demonstrated in Section 3, facilities that implement source reduction through mercury minimization plans and pretreatment, can achieve significant mercury reductions in the effluent and in some cases they can achieve mercury effluent concentrations similar to that detected at facilities employing advanced treatment.

(b) (5)

2.2.2 Mercury Levels Achieved by Other Treatment Technologies

In reviewing the ability of other available wastewater treatment technologies to remove mercury, DEQ could not find any pilot or full-scale treatment systems that would be able to achieve the water concentration target of 0.14 ng/L.

Because there is a lack of full-scale installations consistently producing effluent mercury concentrations at levels less than those found in secondary or advanced treatment, it is difficult to predict whether it is possible to consistently achieve these concentrations on a long-term, large-scale basis. A 1997 study in Ohio concluded that *the ability of the added controls to meet the standard was not known* (Ohio EPA, 1997). The Ohio mercury criterion for aquatic life is 1.3 ng/L. In Oregon, the WQBEL needed to meet the human health criterion for methylmercury is 0.14 ng/L, an order of magnitude lower than the Ohio and Michigan standards. If the ability of the controls, short of reverse osmosis, to meet 1.3 ng/L is not known, it is reasonable to conclude that there is no feasible technology that can meet 0.14 ng/L.

(b) (5)

This conclusion is consistent with a review conducted by HDR in 2013 for the Association of Washington Businesses (HDR, 2013). The HDR study examined the potential performance of adding reverse osmosis or granular activated carbon to a tertiary microfiltration process and hypothesized that such a treatment system *might* be able to remove mercury to a concentration of 0.12 to 1.2 ng/L. However, the study provided no data from any test or operational system. Such treatment systems have not been employed on a bench or pilot scale, or at a wastewater treatment plant scale to DEQ's knowledge.

Membrane filtration technology, such as reverse osmosis, uses a significant amount of electricity, creating a substantial carbon footprint, and requires disposal of waste brine. According to a life cycle assessment performed for the Berlin-Ruhleben secondary wastewater treatment plant (63 MGD), the operational energy use of polymer ultrafiltration or ceramic microfiltration membranes would be 0.33 watt×hour/gal. This would represent approximately a 9 percent increase in that plant's existing global warming potential without taking into account the additional global warming potential that would be contributed by the infrastructure, chemicals for maintenance and any necessary coagulant, and the transport of waste sludge for disposal. Of the different types of membrane filtration, reverse osmosis also has the large disadvantage of necessitating disposal of the concentrate stream, which can amount to approximately 5 to 20 percent of the influent.

A 2007 EPA report regarding mercury treatment notes that there are technologies, such as precipitation, filtration or other physical/chemical treatments (see Table 2-1) that remove more mercury than secondary or advanced wastewater treatment plants. However, these have been employed in industrial settings where influent concentrations were an order of magnitude higher than influent concentrations at municipal wastewater treatment facilities (US EPA, 2007). The effluent concentrations at many of these industrial applications were similar to the influent concentrations at municipal treatment facilities. Moreover, the information provided in the EPA report did not indicate flow volumes, so it is difficult to translate these studies to typically larger municipal wastewater treatment plant volumes.

In another study, an oil refinery evaluated various treatment technologies for wastewater with low (10 ng/L) mercury levels to determine the extent to which mercury concentrations could be further reduced using conventional treatment. Bench scale tests of various adsorbent techniques showed that they could remove mercury to as low as less than 0.08 ng/L of total mercury (Urgun-Demirtas, et al., 2013). Ultra- and micro-filtration bench tests also reduced mercury to less than 1 ng/L, although not as much as adsorption. However, such techniques have not been shown to work at the higher volume in municipal treatment (HDR, 2013).

Table 2-1 shows the results from treatment technologies that have been tested for water supply treatment or industrial wastewater treatment. Table 2-2 summarizes mercury concentrations achieved from various technologies. As shown in these tables, no technology has consistently reached mercury concentrations less than that achieved by activated sludge (secondary treatment) or activated sludge with nutrient removal or tertiary filtration (advanced treatment) at flow volumes typically seen at large municipal WWTPs (>1 MGD).

(b) (5)

Table 2-1. Potential treatment technologies considered for mercury treatment

Study	Type of treatment technology	Influent total mercury concentration (ng/L)	Average effluent total mercury concentration (ng/L)	Percent removal	
US EPA (2007)	Precipitation (Chelator)	400-9,600,000	25-21,400	42-99 9%	Full scale for groundwater and wastewater treatment; not tested for municipal wastewater or industrial processes in Willamette Basin
EPA (2007)	Adsorption/ Granular Activated Carbon	3,300-2,500,000	300-1,000	99-99 8%%	Full scale
HDR Study (2013)	Tertiary Microfiltration/ Reverse Osmosis or Granular Activated Carbon		0 12-1 2 hypothetically	>99%	Not demonstrated at WWTP scale
Urgun-Demirtas, et al (2013)	Precipitation	10 ng/L	3 1 ng/L (before filtration) 0 17 ng/L (after filtration)	56 5% before filtration	Bench scale testing
Urgun-Demirtas, et al (2013)	Adsorption	10 ng/L	<0 08 ng/L – 0 72 ng/L (lowest achieved)	92 8% - 99 2%	Bench scale testing
Urgun-Demirtas, et al (2013)	Filtration	10 ng/L	0 26 – 0 34 ng/L (lowest achieved)	65 – 97% depending on pressure	Bench scale testing

Study	Type of treatment technology	Influent total mercury concentration (ng/L)	Average effluent total mercury concentration (ng/L)	Percent removal	
Hollerman, et al (1999)	Adsorption	739-1447 ng/L	~25-340 ng/L	n/a	Low volume

Table 2-2. Treatment capability of mercury technologies

Treatment Technology	Volume Range of Known Uses	Treatment Ability
Activated sludge	Up to 25 MGD	3-50 ng/L
Activated sludge w/ Nutrient Removal or Filtration	Up to 25 MGD	1-10 ng/L
Membrane Filtration	Low volume	Bench scale to 0.26 ng/L
Ion Exchange	0.015 MGD (5-50 GPM)	1 ng/L
Precipitation and filtration	Low volume	Bench scale to 0.17 ng/L; full scale to 25 ng/L
Adsorption	Low volume	Bench scale to 0.08 ng/L; full scale to 25 ng/L

3. Variance Requirements

To comply with federal regulations, a variance must include a statement of the highest attainable condition during the term of the variance, the term of the variance, and the requirement to re-evaluate the highest attainable condition at least every 5 years. These requirements are discussed below.

3.1 Highest Attainable Condition

The federal variance rule states, "The requirements (of the variance) shall represent the highest attainable condition of the waterbody or waterbody segment applicable throughout the term of the WQS variance."[4] For a discharger specific variance, the HAC may be expressed in one of three ways:

1. HAC #1 is "the highest attainable interim criterion," and establishes an alternate instream criterion for the term of the variance.
2. HAC #2 is "the interim effluent condition that reflects the greatest pollutant reduction achievable." This option is appropriate when a treatment upgrade is feasible and would provide additional pollutant removal that will result in mercury reductions.
3. HAC #3 applies "if no additional feasible pollutant control technology can be identified," in which case the HAC3 is "the interim criterion or interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the state adopts the WQS variance and the adoption and implementation of a pollutant minimization plan."[5]

(b) (5)

DEQ concluded that HAC #3 is appropriate under this MDV, as described below.

3.1.1. Justification for HAC #3 for facilities with advanced treatment

For facilities with advanced wastewater treatment, there is no feasible technological upgrade that will reduce mercury loads in a discharger's effluent in order to achieve a WQBEL based on the underlying designated use and criterion, as demonstrated in Chapter 2. Thus, for these facilities, HAC #3 is appropriate. Based on available data provided in Section 2.2, these facilities with advanced treatment are already capable of achieving annual average mercury concentrations of 1 - 3.5 ng/L, which is near the limits of currently feasible technology. DEQ will include permit effluent limits based on the level currently achievable, using the methodology described in Section 4, and require the facility to develop and implement an MMP including monitoring and reporting requirements.

(b) (5)

The following facilities currently have advanced treatment:

Permittee	Receiving Waterbody
Clean Water Services – Rock Creek STP	Tualatin River
Clean Water Services – Durham STP	Tualatin River
McMinnville Water Reclamation Facility	South Yamhill River

[4] 40 CFR Part 131 14(b)(1)(ii)
[5] 40 CFR 131 14(b)(ii)(A)

3.1.2. Justification for HAC #3 for municipal facilities without advanced treatment

(b) (5)

As noted in Section 2, on average, mercury effluent limits in facilities with advanced or tertiary treatment are slightly lower than in facilities with only secondary treatment. Based on this information, HAC #2 may seem appropriate for facilities without advanced treatment, as there is additional treatment that may lead to ancillary mercury reductions at most facilities covered under the variance. However, as summarized in Table 3-1, DEQ has determined that HAC #3 is the most reasonable approach for the MDV due to the following reasons:

- Advanced treatment is not designed to remove mercury, and mercury effluent concentrations are highly variable, even when influent concentrations are similar. Due to this variability, even under a well-operated system, it is not possible to set a future effluent condition, as is required by HAC #2.
- EPA guidance recommends that states adopting mercury variances require dischargers to implement MMPs. The guidance states, “By reducing mercury sources up front, as opposed to traditional reliance on treatment at the end of a pipe, diligent implementation of MMPs might mitigate any adverse effects of a variance by improving the water quality.” (US EPA, 2010)
- Source reduction activities over time can result in significant reductions in effluent mercury levels when assessed in aggregate over multiple facilities (Section3.1.2.1);
- It will cause greater environmental damage to remove the mercury through treatment than through source reduction due to higher energy costs and the need for additional waste disposal (Section 3.1.2.2). DEQ estimates that advanced treatment would result in energy costs equivalent to 9,500 to 12,000 CO_2 equivalents per year. Moreover, because wastewater dischargers only contribute less than 1% of the total mercury load to the Willamette, such reductions will not have a measurable impact on water column mercury concentrations. Moreover, treatment will produce more mercury in biosolids, which keeps mercury cycling in the environment
- Advanced treatment would be expensive, costing Oregon ratepayers an estimated $15,000,000 - $36,000,000 per year without measurable environmental benefit (Section 3.1.2.2).
- HAC #2 would require DEQ to establish an interim effluent condition that would be achieved by the discharger by the end of the variance, then establish a compliance schedule to provide a discharger time to meet the interim effluent condition. This approach implies that such an outcome is both feasible and desirable, which the data and information related to treatment technologies do not bear out relative to mercury. As a result, this approach would put in place additional requirements without a commensurate outcome.
- Oregon state law specifies that, to the extent allowable by federal law, through granting of variances, DEQ shall protect human and ecosystem health by controlling pollutants while also minimizing negative economic impacts on Oregon’s economy.[6] Requiring treatment upgrades would result in negative economic impacts to dischargers while not measurably improving exposure to mercury through fish consumption.

(b) (5)

Commented [DMG21R20]: I don't necessarily think (b) (5) [redacted]

[6] ORS 468B 037

Table 3-1. Estimated Energy and Fiscal Impacts of Installing Advanced Treatment for Major Domestic Facilities in the Willamette Basin.

	Advanced treatment for 21 municipal facilities	Current treatment plus MMP implementation
Amount of wastewater treated	>97 MGD[7]	>97 MGD
Oregon water quality criterion: 0 14 ng/L	Does not meet standard; no measurable change in water column concentration	Does not meet standard; no measurable change in water column concentration
Average effluent concentration	1-3 5 ng/L	Currently 1-5 5 ng/L MMP implementation will reduce loads over the term of the variance
Energy increase	17,000 – 21,000 MWh/year	No expected change
Annual carbon footprint increase	9,500 – 12,000 metric tons CO_2 equivalent	No expected change
Annualized Capital and annual O&M Costs	\$15,000,000 - \$36,000,000	No expected change
Timeline	10+ years	20 years
Other benefits	Reduced concentrations of other pollutants through treatment	Reduced concentrations of other pollutants through MMP implementation
Other impacts	Increased administrative burden through need for compliance schedule	No expected change

(b) (5)

(b) (5)

As required under HAC #3, permit conditions will be consistent with the interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the state adopts the WQS variance and the adoption and implementation of a pollutant minimization plan. DEQ will analyze progress in reducing mercury during re-evaluation of the HAC conducted every five years.

3.1.2.1. Mercury Reductions Achieved Through Minimization Could Potentially Achieve Similar Concentrations as Advanced Treatment

As noted in Section 2.2.1, municipal dischargers with advanced treatment or additional filtration have average mercury effluent concentrations ranging from 1-3.5 ng/L. Some secondary systems have similar mercury concentrations as those with advanced treatment; some have higher concentrations. As noted in that discussion, these concentrations vary widely over time, often due to unknown circumstances. Data from other states indicates that over the 20-year proposed term of the variance, appropriate implementation of the required MMP at facilities without advanced treatment can result in aggregate reductions of mercury in the effluent.

[7] Based on current flow figures Does not include flow for City of Portland – Tryon Creek STP, Lebanon WWTP, or Cottage Grove STP

The Wisconsin Department of Natural Resources tracked mercury effluent data from NPDES permittees over the past fifteen years, as permitted facilities have been implementing MMPs under the Great Lakes Initiative. The data, as indicated in the following discussion, show that MMP implementation has resulted in similar effluent mercury concentrations as advanced wastewater treatment.

WDNR tracks mercury concentrations using average effluent concentration and a short- and long-term 99th percentile metric. Among 52 municipal dischargers, the average long-term 99th percentile concentration decreased from 11.2 ng/L in the initial 5-year period to 3.2 ng/L in the most recent 5-year period (2014-2018). The median 99th percentile also decreased from 5.2 to 2.8 ng/L. All but three municipal systems experienced decreasing trends in average effluent concentrations and all but eight experienced decreasing 4-day P99 concentrations (Figure 5-1). Moreover, whereas 13 facilities had 4-day P99s greater than 8 ng/L in their initial permit term, only one facility had a 4-day P99 greater than 8 ng/L based on the most recent data (Figure 3-2), highlighting how effluent levels have decreased over time. The mercury concentrations seen at most of these facilities are within the range seen at advanced municipal wastewater treatment plants. According to WDNR staff, none of these facilities use advanced treatment and have achieved these levels primarily through MMP implementation.[8]

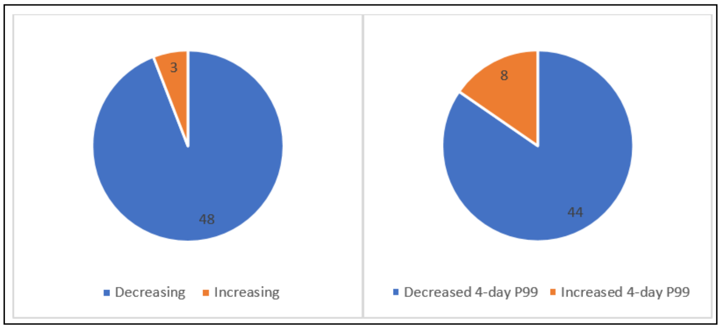


Figure 3-1. Number of Wisconsin municipal wastewater treatment systems with increasing and decreasing trends in average (left) and 4-day P99 (right) concentrations. (Wisconsin DNR).

Source: Wisconsin Department of Natural Resources.

[8] *Personal communication*, Laura Dietrich, Wisconsin Department of Natural Resources, 2/28/19

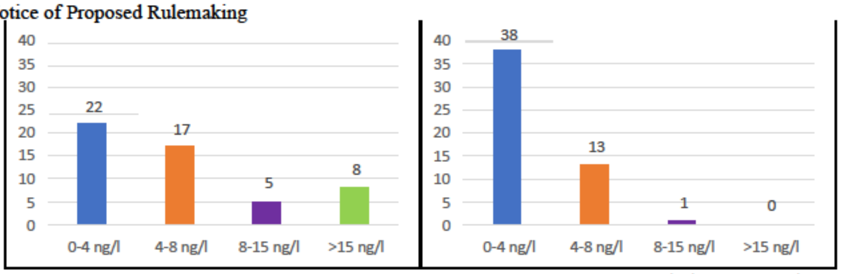


Figure 3-2. Number of Wisconsin municipal WWTPs by 4-day P99 mercury concentrations from initial five-year period (left) to most recent five-year period (right).

Source: Wisconsin Department of Natural Resources.

DEQ is proposing an aggregate reduction through MMP implementation because not all facilities implementing MMPs show continued mercury reduction. For example, the City of Stevens Point, Wisconsin found that influent levels were highly variable even after MMP implementation (Stevens Point Public Utilities 2018). Effluent mercury levels declined over time, but were still variable. The city determined that legacy mercury in the collection system was likely causing this variability. The City of Oshkosh similarly concluded that influent variability arose from cleaning and maintenance of its collection system, but that additional removal of additional legacy material would eventually reduce periodic spikes in mercury influent concentrations (City of Oshkosh, 2018).

(b) (5)

Evidence from influent and biosolids data also indicates the effectiveness of MMPs in reducing mercury, even if effluent levels are variable. A decade of mercury influent data from 72 major NPDES wastewater treatment plants in Minnesota indicate that MMPs resulted in significant and continued reductions in mercury concentrations entering treatment systems. Between 2008 and 2017, influent total mercury concentrations decreased from an average of 180 ng/L to 70 ng/L (Figure 3-3). Data from Oregon's Rock Creek Advanced Wastewater Treatment Plant operated by Clean Water Services indicates decreasing mercury levels in biosolids, showing the effectiveness of their mercury reduction efforts over the last 20 years (Figure 3-4).

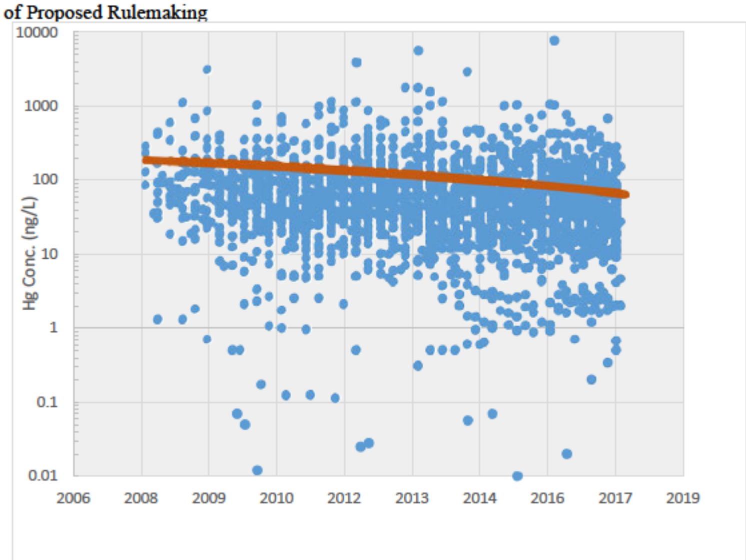


Figure 3-3. Influent Data from Major Wastewater Treatment Plants in Minnesota. Source: Minnesota Pollution Control Agency

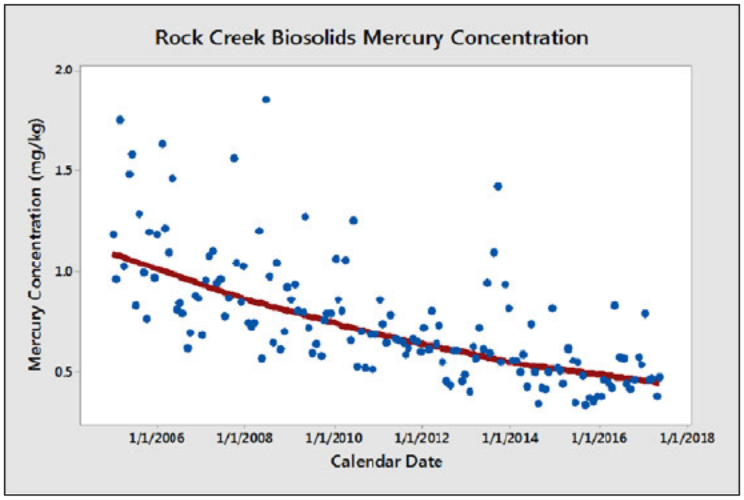


Figure 3-4. Mercury Concentra ions in Biosolids, Rock Creek Wastewater Treatment Plan. Source: Clean Water Services.

3.1.2.1. Advanced treatment will cause more environmental damage than MMP implementation, will result in negative economic impacts and create additional administrative burden without a measurable impact on the environment

In addition to eventually achieving similar effluent concentrations as advanced treatment, MMP implementation incurs less environmental damage than advanced treatment. Environmental damage associated with advanced treatment include greater energy consumption, added greenhouse gas emissions, and the need for additional waste disposal.

According to a report from the Water Research Foundation and Electric Power Research Institute, daily energy consumption at advanced treatment plants is about 500-600 kwh per million gallons per day higher than that of secondary activated sludge plants (EPRI and WRF, 2013). Flow data is available for seventeen of the twenty facilities covered under the variance. The total daily flow of these facilities is 97 MGD. DEQ estimates that the additional annual energy consumption to upgrade to advanced treatment is 17,000-21,000 megawatt-hours per year. This equates to an annual carbon footprint increase of approximately 9,500 to 12,000 metric tons carbon dioxide equivalent per year.[9] Additional waste disposal required by wastewater treatment would add additional carbon footprint due to the need to haul additional material. Moreover, waste disposal could result in land application of biosolids containing mercury, which could release back to the environment.

The total mercury load from all point sources in the Willamette Basin is 1.6 kg/year, or less than 1% of the total annual load of mercury to the basin (ODEQ, 2019). Treatment upgrades at the estimated number of facilities with higher mercury concentrations would only reduce a portion of this load, which also will likely be achieved eventually through source reduction without the associated environmental damage. Therefore, DEQ has concluded that the additional energy use and waste disposal associated with advanced treatment would cause more environmental harm than removing similar amounts of mercury load through MMPs, which focus on source reduction.

Oregon statutes require that, to the extent allowable by federal law, through granting of variances, DEQ shall protect human and ecosystem health by controlling pollutants while also minimizing negative economic impacts on Oregon's economy.[10] To examine the cost of installing advanced treatment solely to remove mercury, DEQ utilized an EPA report examining capital and O&M costs associated with installing nutrient removal at municipal wastewater facilities (US EPA, 2008). Based on case studies presented in the EPA report, annualized capital costs (20 years at 6%) plus annual O&M costs range from $155,000 to $375,000 per MGD in 2019 dollars. Based on this estimate, installation of advanced treatment at all 20 municipal facilities that do not currently have advanced treatment would cost $15,000,000 to $36,000,000 per year without a measurable difference in mercury as compared to source control, which is already required under DEQ guidance and thus does not add extra costs to these facilities. As a result, DEQ has concluded HAC #3 would minimize negative impacts on Oregon's economy while still making progress toward protecting human health.

---

[9] To calculate the annual carbon footprint, DEQ utilized carbon footprint information utilized in the 2019 Triple Bottom Line analysis to support the chloride and mercury variance for the city of Madison, Wisconsin
[10] ORS 468B 037

Under HAC #2, DEQ would need to establish an interim effluent condition based on the greatest pollutant technology achievable, which is difficult to establish because available treatment only achieves ancillary mercury removal. In addition, DEQ would then need to include a compliance schedule within the permit to provide time for the facility to design, obtain financing and install such treatment. This outcome would require additional administrative steps without measurable mercury reduction in the waterbodies and cause additional environmental impacts. In addition, this approach is contrary to the data and information about the most cost-effective means of reduction. The EPA guidance recommends states adopting mercury variances require dischargers to implement MMPs. The guidance states, "By reducing mercury sources up front, as opposed to traditional reliance on treatment at the end of a pipe, diligent implementation of MMPs might mitigate any adverse effects of a variance by improving the water quality" (US EPA, 2010). This further supports the HAC #3 as the most reasonable option.

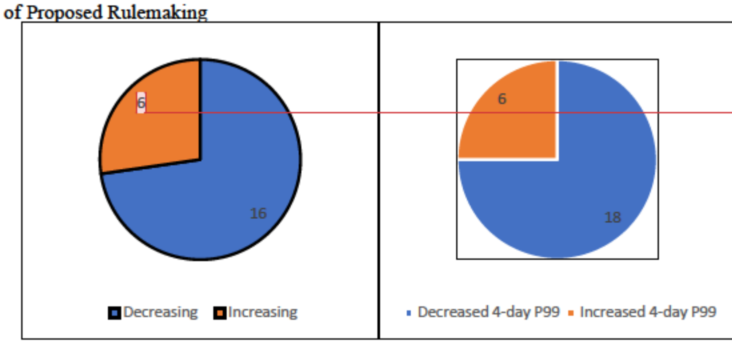
3.1.3. Justification for HAC #3 for industrial facilities

Industrial facilities in the Willamette Basin that would be eligible for this variance operate similar treatment to municipal facilities. Many of the same arguments that apply to municipal facilities apply to industrial facilities: 1) No treatment is available that can reliably meet the water quality standard; and 2) installation of additional treatment will cause more environmental damage than leaving the pollution in place. Industrial facilities in the Willamette Basin contribute approximately 0.3% of the total load of mercury to the Willamette. Moreover, these facilities have effluent levels of mercury that average less than 15 ng/L. Finally, industrial facilities have no control over mercury levels in intake water, which do not currently meet water quality standards. However, they can achieve mercury reductions through material identification and substitution.

Given the high environmental costs of treatment and the effectiveness of source reduction and the small contribution to the overall load, DEQ has concluded that it is the best option to establish an effluent limit based on levels currently achievable. These facilities will continue to focus on MMP implementation, rather than installing advanced treatment technologies solely for the reduction of mercury

(b) (5)

Available data from Wisconsin industrial dischargers indicates that MMP implementation has resulted in an overall decreasing trend in mercury concentrations at industrial facilities. Among 24 industrial NPDES permit holders, the mean 4-day P99 decreased from 25.4 to 13.7 ng/L and the median 4-day P99 decreased from 14.1 to 7.2 ng/L between 2004 and 2018. Eighteen of the 24 facilities had lower 4-day P99 concentrations in the most recent five-year period as compared to the initial period, and sixteen had decreasing average mercury concentrations (Figure 3-5). Finally, while only one additional facility had a 4-day P99 less than 8 ng/L from the initial five-year period to the most recent, five fewer facilities had concentrations greater than 15 ng/L (Figure 3-6). The success of these dischargers in continuing to reduce mercury indicates that industrial dischargers in the Willamette Basin can achieve similar continued success, even for those that have been implementing MMPs for several years.



(b) (5)

Figure 3-5. Number of Wisconsin industrial wastewater treatment systems with increasing and decreasing trends in average (left) and 4-day P99 (right) concentrations.

Source: Wisconsin Department of Natural Resources.

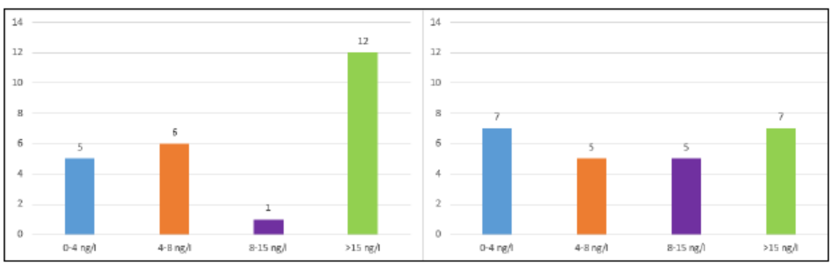


Figure 3-6. Number of Wisconsin industrial NPDES facilities by 4-day P99 mercury concentrations from initial five-year period (left) to most recent five-year period (right).

Source: Wisconsin Department of Natural Resources.

3.1.4. Justification for HAC #3 for facilities that are planning to install treatment upgrades

In some cases, a facility may be required to upgrade its treatment system to meet limits other than mercury. An upgrade may also have the ancillary benefit of reducing mercury concentrations. As noted, advanced treatment is not designed to target a specific mercury level; effluent mercury concentrations are variable in such systems. For these facilities, HAC #3 is still appropriate. Until the upgrade is operational, DEQ will issue an effluent limit based on the level currently achievable with the technology installed at the time the variance is issued. DEQ will then update the permit limit based on recent data after the following a five-year HAC re-evaluation according to the process outlined in Section 3.3.

(b) (5)

3.2 Requirements that apply throughout the term of the variance

This section describes the requirements of the variance, consistent with HAC #3. First, the discharger will receive a permit limit based on the effluent conditions reflecting the level currently achievable. Second, the discharger will be required to implement a mercury minimization plan with required elements noted in section 3.2.2. DEQ describes how it will incorporate variance requirements into permit requirements in Section 4.

3.2.1 Interim Effluent Condition that Reflects the Level Currently Achievable

The HAC for the MDV is expressed in the federal variance rule as "the interim criterion or interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the **State** adopts the WQS variance, and the adoption and implementation of a **Pollutant Minimization Program**." DEQ uses the term "Level Currently Achievable" to describe "the interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the State adopts the WQS variance."

In order to calculate the LCA for mercury for each facility, DEQ will use the most recent five years of mercury effluent data at the time of each permit issuance, with a minimum of eight quarterly samples that span at least two years. **Each sample is a single data point, even when the facility collects samples on three consecutive days, as required by the pretreatment program.** **The TSD methodology (Table E-1), with lognormal transformation and no auto-correlation, is used to calculate the 95th percentile of the effluent data distribution to describe the Level Currently Achievable.** DEQ used data from four facilities to demonstrate how DEQ would calculate these levels (Figures 3-7 – 3-10). The LCA value is equal to the 95th percentile of the distribution shown in each chart. **The figures also include the 99th percentile value for information only**

(b) (5)

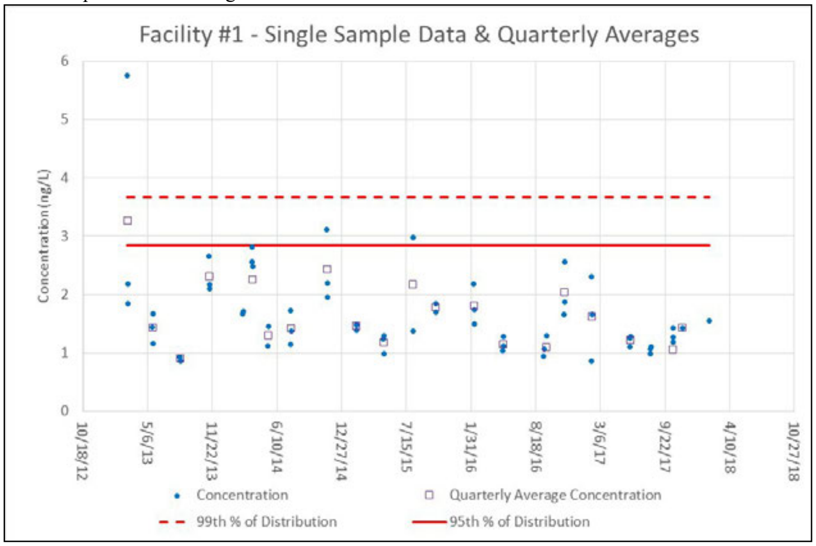


Figure 3-7. LCA (95th percentile) of hypothe ical facility under the MDV.

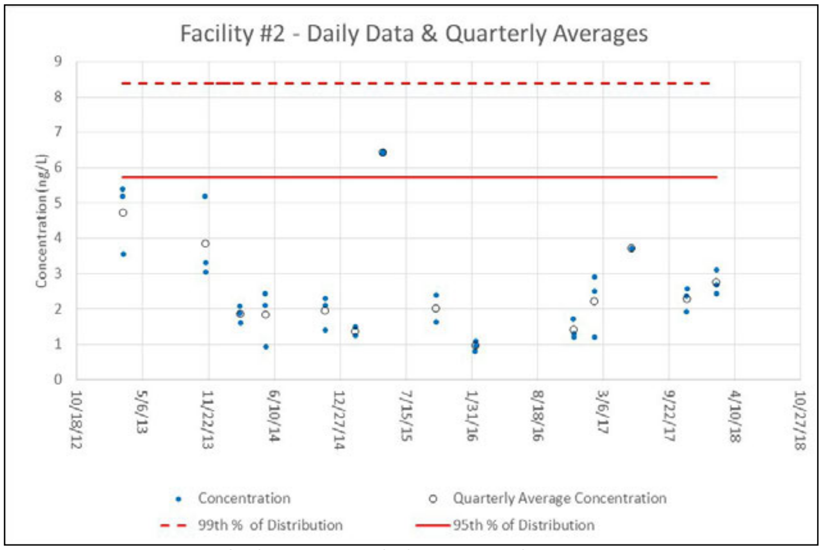


Figure 3-8. LCA (95th percentile) of hypothe ical facility under the MDV.

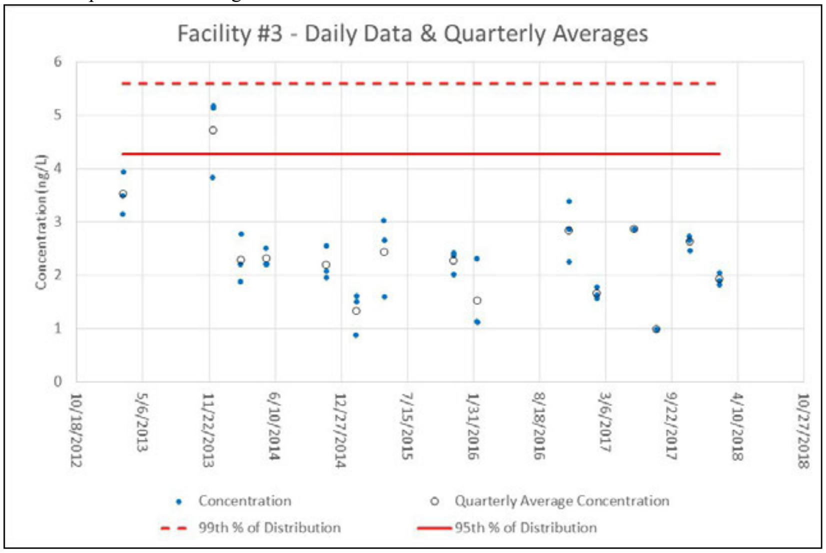


Figure 3-9. LCA (95th percentile) of hypothetical facility under the MDV.

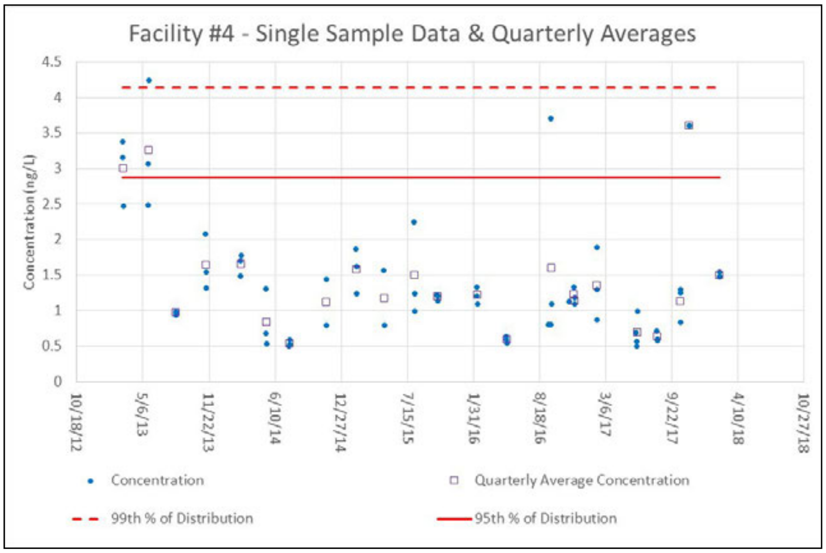


Figure 3-10. LCA (95th percentile) of hypothetical facility under the MDV.

3.2.2 Implementation of a Mercury Minimization Plan

The variance also requires all permittees that obtain coverage under the variance to implement a mercury minimization plan. The MMP must include mercury reduction activities throughout the term of the variance.

(b) (5)

As many municipalities nationwide have implemented MMPs over two or more decades, there is a body of knowledge upon which to draw to focus efforts on those activities that will result in mercury reductions. DEQ has included language in the draft rule highlighting types of activities minimally expected from municipal and industrial facilities. Required elements of an MMP for municipal facilities must include the following:

1. Influent, effluent, and biosolids monitoring and other monitoring
2. Annual reporting
3. Identification and inspection of dental offices to ensure installation of amalgam separators, if not otherwise required;
4. Identification of mercury-containing materials at facilities and offices operated by each municipal wastewater treatment facility and implementation of any recommendations for removing mercury-containing materials;
5. Identification and inspection of commercial laboratories, schools and healthcare facilities that may have mercury and providing recommendations and outreach materials to these facilities;
6. Providing general outreach materials for commercial and residential sectors.
7. Evaluation of new facilities within a collection system as sources of mercury and outreach to provide recommendations on mercury reduction activities.
8. Facility-specific activities to reduce mercury loading within the Basin, which may include addressing legacy mercury in collection systems, as well as cost-effective and reasonable best management practices for nonpoint source controls that the permittee could implement during the term of the variance to make progress towards attaining the underlying designated use and criterion.
9. If a facility has accomplished all activities within its system, the facility may achieve additional reductions by implementing or funding offsite mercury reduction activities, such as erosion control, which will make progress toward attaining the underlying designated use and criterion.

Required elements of an MMP for industrial facilities must include:

1. Effluent and biosolids monitoring, if relevant and other monitoring, if needed.
2. Annual reporting
3. Identification of mercury-containing materials used in the facility, offices and testing laboratories
4. Developing and implementing recommendations for using substitute materials with less or no mercury;
5. Identification of other potential sources of mercury within control of the facility;
6. Facility-specific activities to reduce mercury loading within the Basin, which may include cost-effective and reasonable best management practices for nonpoint source controls that the permittee could implement during the term of the variance to make progress towards attaining the underlying designated use and criterion.

3.2.3 State Activities to Reduce Mercury Loads

DEQ's draft plan to reduce mercury loads is presented in Chapter 13 of the Willamette Basin Mercury TMDL (Oregon DEQ, 2019). Table 3-2 summarizes DEQ programs that have the potential to reduce nonpoint source mercury loading to the Willamette Basin. In addition, the TMDL also describes activities that other designated management agencies will implement to reduce mercury loads, including the following agencies:

- Oregon Department of Agriculture
- Oregon Department of Forestry
- Oregon Department of State Lands
- Oregon Department of Parks and Recreation
- Oregon Department of Geology and Mineral Industries
- Oregon Department of Fish and Wildlife
- Oregon State Marine Board

Table 3-2. Summary of DEQ programs that have the potential to reduce mercury loading in the Willamette Basin

DEQ NPS Program	How it Protects/ Supports Water Quality
Nonpoint Source TMDL Implementation Program	Outlines and implements management goals, projects, and water quality monitoring for pollutant reductions that are needed in order meet Oregon's water quality standards, including mercury and methylmercury
Onsite Program	Protects human health and the environment by establishing requirements for the construction, alteration, repair, operation and maintenance of onsite wastewater treatment systems
Clean Up Program	Protects human health and the environment by identifying, investigating, and remediating sites contaminated with hazardous substances, including mercury
Nonpoint Source 319 Grant Program	The 319-grant program funds cooperating entities for activities that address NPS emphasizing watershed protection and enhancement, watershed restoration, voluntary stewardship, and partnerships among watershed stakeholders, such as DEQ's Pesticide Stewardship Partnership This includes alignment with significant match funding provided through the Oregon Watershed Enhancement Board (OWEB)'s parallel granting programs
Clean Water State Revolving Fund	SRF loans finance a variety of nonpoint source water quality plans and projects Eligible activities include integrated and stormwater management plans, establishing or restoring permanent riparian buffers and floodplains and daylighting streams from pipes

DEQ also oversees stormwater and point source (NPDES) permitting programs that will reduce mercury loads to the river over time; this includes municipal stormwater (MS4) permits. DEQ is incorporating the draft water quality management plan by reference. It is available at the following link: https://www.oregon.gov/deq/wq/Documents/tmdlWillHgD.pdf.

(b) (5)

As noted in the TMDL, it will take decades for the activities to be fully implemented. Because of the large between reducing concentrations in the water column and for those reductions to show up in fish tissue, it will take even longer for those activities to result in decreased fish tissue concentrations of methylmercury that will meet the water quality standard for methylmercury.

3.3 Proposed term of the variance

Federal variance rules specify that variance terms shall be only as long as necessary to meet the HAC.[11] As described in Section 3.2, the HAC is the effluent condition reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time Oregon adopts this variance, and the adoption and implementation of an MMP. DEQ has concluded that MMP activities described in Section 3.2.2 will take 20 years for dischargers covered under this variance and will continue to make progress toward the criterion during this time. These activities include facility specific activities, including nonpoint BMPs that facilities can continue to undertake once they have done most of the activities that will directly influence mercury levels in their influent. As noted in the Section 3.2, MMP implementation in Wisconsin continues to make progress toward the state's mercury standard of 1.3 ng/L more than 15 years since the state began tracking mercury data. Facilities in Wisconsin continue to implement MMPs.

As a result, DEQ proposes that the Willamette Basin Mercury MDV have a term of 20 years. According to the 2019 draft Willamette Basin Mercury TMDL, it will take decades to achieve the human health methylmercury criterion, so DEQ does not expect that the standard will be achieved in the waterbody at the end of the variance. A 20-year term will provide DEQ sufficient time to collect and evaluate data to determine the extent to which the variance has resulted in decreased influent and effluent mercury concentrations.

(b) (5)

3.4 Re-evaluation of the Highest Attainable Condition

Federal rules require that DEQ re-evaluate the HAC at least every five years. The HAC re-evaluation process provides the permittee the opportunity to document the success of mercury minimization efforts and update its MMP. Re-evaluation also provides DEQ and the public the opportunity to determine if source reduction efforts have resulted in progress toward meeting the water quality standard.

DEQ will re-evaluate the HAC five years after EPA's approval of the MDV and each 5 years after that. DEQ's review will include the following elements:

(b) (5)

- An assessment of treatment technology to determine if there have been any changes that would change DEQ's evaluation of the appropriate HAC. The analysis will answer the following questions:
    - Is there pollutant control technology feasible to meet water quality based effluentlimits based on the underlying designated use and criterion?
    - Is there additional treatment that is feasible to make progress toward the water quality standard, beyond what would be attained through MMP implementation?

[11] 40 CFR 131 14(b)(1)(iv)

- A summary of mercury minimization efforts conducted by all facilities covered under the MDV.
- An examination of data provided by these facilities to assess whether source reduction activities have resulted in mercury reductions and calculating a new LCA when appropriate. DEQ will look at overall trends in influent, effluent, biosolids and other data.

As required under federal rules, DEQ will prepare a public notice and provide a 30-day public comment period. This public comment period may include an information session or hearing to be held in the Willamette Basin. Finalizing public comment, DEQ will make any necessary changes before submitting a final document to EPA within 30 days of completing the evaluation and making the final document available on the agency website. In addition, if DEQ does not re-evaluate the HAC at least every five years or submit the results of the re-evaluation to EPA, the variances will no longer be the applicable water quality standard for purposes of the Clean Water Act until such time that the re-evaluation is completed and submitted to EPA.

4. Variance Application and Issuance Process

4.1 Application Process for Coverage under the MDV

Once EPA approves the MDV, eligible NPDES dischargers can apply for coverage under the variance concurrent with applying for permit renewal. The rule requires each permittee to provide the following information to qualify for the MDV:

- Information about the facility's treatment system, including their current treatment technology, the location of their discharge outfall, and their pretreatment program, if applicable.
- The most recent mercury effluent data (as much as available for the last 5 years, but not less than two years).
- Other available mercury data from the previous five years, including influent data, biosolids data, and any other data collected to track mercury sources. Such data will assist DEQ in supporting its decision to justify the variance application and will be used in the 5 year HAC reviews.
- A description of prior mercury minimization efforts to date. This could include copies of any MMP progress reports that have been submitted under the previous permit cycle, if they are available.
- A draft facility-specific MMP that will cover the term of the variance and include the elements listed in Section 3.2 and the rule. The MMP will undergo public comment along with the permit. DEQ permit staff will work with the permittee to ensure that the MMP meets DEQ requirements before the final permit and variance authorization are issued.

(b) (5)

4.2 Variance-related permit requirements

Once DEQ has received all necessary information from the permittee, staff will incorporate variance-related permit requirements into the draft permit, as described below. DEQ will, as part of the standard public comment period for each permit, take comment on authorization of the variance and variance-related permit requirements, including comments on facility specific MMPs submitted by the permittee. Following the public comment period, DEQ will incorporate any needed changes to the permit before finalizing the permit.

4.2.1 Effluent limit based on the Level Currently Achievable

DEQ will include an interim effluent limit in each permit based on the procedure described in Section 3.2.1. These permit limits will apply as a quarterly average concentration, not to be exceeded in 2 consecutive quarters.

Because many facilities sample mercury just once per quarter, a spike in mercury concentrations could cause an exceedance of the quarterly average, while not being indicative of a problem in treatment operations. Therefore, it is not appropriate to set a permit limit based upon the sampling results for a single quarter. Instead, DEQ proposes to define a violation of the maximum quarterly average permit

limit as two consecutive quarters in which the quarterly average is above the 95th percentile of the distribution. Thus, one quarterly average above the 95th percentile is not a permit violation. However, if the quarterly average is above the 95th percentile again in the following sampling period, then the limit has been exceeded.

(b) (5)

Most facilities that sample for mercury do so as part of their pretreatment programs. This sampling is typically conducted on three consecutive days, once per quarter. DEQ does not propose additional sampling. However, DEQ allows additional samples. If additional samples are collected, the results must be included when calculating the quarterly average.

4.2.2 Monitoring requirements

DEQ will incorporate effluent monitoring requirements into the permit to ensure compliance with the LCA-based interim effluent limit. DEQ will require a minimum of quarterly mercury effluent monitoring for each facility. Many facilities already collect at least this amount of mercury effluent data under pre-treatment programs or current permit requirements.

4.2.3 Implementation of a Mercury Minimization Plan

DEQ will include a requirement in the permit to implement the MMP as described in Section 3 2.2. The MMP must include mercury reductions activities throughout the 20-year term of the variance. During re-evaluation of the variance for the next permit cycle, the facility can add mercury reduction activities to the existing MMP.

4.2.4 Annual progress reports

The permit will require an annual progress report. The progress report should include, at a minimum, the following information:

- All effluent, influent, biosolids and other mercury data collected over the course of each year of the permit cycle;
- A summary of activities conducted under the MMP; and
- Any nonpoint source best management practices implemented under the authority of the permittee to address mercury loads.

4.2.5 Requirements for facilities with increasing mercury effluent concentrations

As demonstrated in Section 2.2, MMP implementation typically results in reductions in mercury effluent concentrations over time. However, effluent mercury concentrations may trend upwards in some facilities from one permit term to the next. During the HAC re-evaluation process, DEQ will not increase the LCA and LCA-based effluent limits when average effluent concentrations have increased from one permit term to the next. This is consistent with federal and state variance requirements. DEQ may require the facility to include additional facility specific commitments in its MMP, potentially to include additional facility audits, or collection system monitoring to identify and address legacy sources of mercury.

(b) (5)

4.2.6 Re-evaluation of requirements during permit renewal

When each permit is renewed, DEQ will re-calculate the LCA based on effluent data collected during the previous five years and incorporate that information into the permit fact sheet. DEQ then will establish an updated interim effluent limit based on the more recent data, as described in Section 4.2.1. In addition, DEQ will require each facility to update their MMP to provide more specificity to activities that will be conducted for subsequent duration of the permit, as well as in future permit terms. The public will have the opportunity to provide comment on the updated MMP and permit requirements during the permit renewal process.

5. Bibliography

Amos, H. M., Jacob, D. J., Streets, D. G., & Sunderland, E. M. (2013). Legacy impacts of all-time anthropogenic emissions on the global mercury cycle. *Global Biogeochemical Cycles, 27*, 410-421. doi:10.1002/gbc.20040

California EPA, Regional Water Quality Control Board, Central Valley Region. 2010. Staff Report: A Review of Methylmercury and Inorganic Mercury Discharges from NPDES Facilities in California's Central Valley.

Chetelat, J., Amyot, M., Arp, P., Blais, J., Depew, D., Emmerton, C., . . . van der Velden, S. (2015). Mercury in freshwater ecosystems of the Canadian Arctic: Recent advances on its cycling and fate. *Science of the Total Environment, 509*, 41-66.

City of Oshkosh (2018). Mercury Source Identification and Reduction Efforts.

Driscoll, C., Han, Y., Chen, C., Evers, D., Lambert, K., & Holsen, T. (2007). Mercury contamination in forest and freshwater ecosystems in the Northeastern United States. *Bioscience, 57*, 17-28.

Eagles-Smith, C., Silbergeld, E., Basu, N., Bustamante, P., Diaz-Barriga, F., & Hopkins, W. (2018). Modulators of mercury risk to wildlife and humans in the context of rapid global change. *Ambio, 47*, 170-197.

Eagles-Smith, C., Ackerman, J., Willacker, J., Tate, M., Lutz, M., & Fleck, J. (2016). Spatial and temporal patterns of mercury concentrations in freshwater fish across Western United States and Canada. *Science of the Total Environment, 568*, 1171-1184.

Electric Power Research Institute and Water Research Foundation. 2013. Electricity Use and Management in the Municipal Water Supply and Wastewater Industries. 194 pp.

Fitzgerald, W., Engstrom, D., Mason, R., & Nater, E. (1998). The case for atmospheric mercury contamination in remote areas. *Environmental Science and Technology, 32*, 1-7.

Hall, B., Bodaly, R., Fudge, R., Rudd, J., & Rosenberg, D. (1997). Food as the dominant pathway of methylmercury uptake by fish. *Water, Air and Soil Pollution, 100*, 13-24.

HDR. 2013. Treatment Technology Review and Assessment. Prepared for the Association of Washington Businesses.

Hollerman, W., L. Holland, D. Ila, J. Hensley, G. Southworth, T. Klasson, P. Taylor, J. Johnston, and R. Turner. 1999. Results from the low level mercury sorbent test at the Oak Ridge Y-12 Plant in Tennessee. Journal of Hazardous Materials B68:193-203.

Lindberg, S., Bullock, R., Ebinghaus, R., Engstrom, D., Feng, X., & Fitzgerald, W. (2007). A synthesis of progress and uncertainties in attributing the sources of mercury in deposition. *Ambio, 36*, 19-32.

Munthe, J., Bodaly, R., Branfireun, B., Driscoll, C., Gilmour, C., & Harris, R. (2007). Recovery of mercury-contaminated fisheries. *Ambio, 36*, 33-44.

Ohio Environmental Protection Agency. 1997. Assessing the Economic Impacts of the Proposed Ohio EPA Water Rules on the Economy. Prepared for the Division of Surface Water by Foster Wheeler Environmental Corporation and DRI/McGraw Hill.

Oregon Department of Environmental Quality. 2019. Draft Willamette Basin MercuryTotal Maximum Daily Load. Portland, OR.

Oregon Department of Environmental Quality. 2017. Statewide Aquatic Tissue Toxics Assessment Report. Laboratory and Environmental Assessment Program. Hillsboro, OR.

Schroeder, W., & Munthe, J. (1998). Atmospheric mercury -- An overview. *Atmospheric Environment, 30*, 809-822.

Stevens Point Public Utilities (2018). Mercury Source Identification and Control PMP.

Tetra Tech, 2019. Mercury TMDL Development for the Willamette River Basin (Oregon) – Technical Support Document (Public Review Draft). Prepared for Oregon Department of Environmental Quality and U.S. EPA Region 10. 162 pp.

Trip, L., & Allan, R. (2000). Sources, trends, implications and remediation of mercury contamination of lakes in remote areas of Canada. *Water Science and Technology, 42*, 171-176.

Urgun-Demirtas, M, P. Gillenwater, M. C. Negri, Y. Lin, S. Snyder, R. Doctor, L. Pierece and J. Alvarado. 2013. Achieving the Great Lakes Initiative Mercury Limits in Oil Refinery Effluent. Water Environment Research 85(1): 77-86.

U.S. Environmental Protection Agency. 2014. *Water Quality Standards Handbook, Chapter 5 General Policies*. Office of Water. EPA 820-B-14-004. Accessed January 9, 2018.

U.S. Environmental Protection Agency. 2010. Guidance for Implementing the January 2001 Methylmercury Water Quality Criterion. Office of Science and Technology. Washington, DC. EPA 823-R-10-001. 221 pp.

U.S. Environmental Protection Agency. 2008. Municipal Nutrient Removal Technologies Reference Document. Office of Wastewater Management, Municipal Support Division, Municipal Technology Branch. EPA 832-R-08-006. 449 pp.

U.S. Environmental Protection Agency. 2007. Treatment Technologies for Mercury in Soil, Waste, and Water. Office of Superfund Remediation and Technology Innovation. Washington, DC. 133 pp.

Attachment 2
Notice of Proposed Rulemaking

State of Oregon
DEQ Department of Environmental Quality

Proposed Revisions to Oregon's Water Quality Variance Rule

Oregon's water quality standards variance rule is found at OAR 340-041-0059 and was last revised in 2011. In 2015, US EPA promulgated federal variance rules. DEQ is proposing revisions to Oregon's rule to ensure it is consistent with federal requirements and to clarify roles and responsibilities for issuing variances. This document explains the proposed rule amendments.

1. **Definitions.** DEQ is proposing to add definitions for "pollutant minimization plan" and "water quality standards variances" under 340-041-0002. These definitions are identical to federal definitions.

2. **Types of variances and authority to issue variances.** The current state rule allows DEQ to grant individual variances. The proposed revisions authorize individual, multiple discharger and waterbody variances, all of which are allowed under the federal rules. The language also clarifies that DEQ's director is authorized to grant individual variances, but the Environmental Quality Commission must grant MDVs and waterbody variances through rulemaking. Variances are considered amendments to water quality standards and therefore, are subject to EPA approval prior to becoming effective.

(b) (5)

3. **Limitations to granting variances.** The current state rule includes several scenarios under which DEQ cannot grant a variance. DEQ is proposing to remove several of these limitations, as follows:

    - The proposed rule keeps the limitation that a variance cannot be granted if the water quality standard can be attained by implementing require technology-based effluent limits. However, the proposed rule removes consideration of cost-effective and reasonable best management practices for nonpoint sources in whether standards can be met. Such language is not included in the federal rule, except when granting waterbody variances.

    - The proposed rule removes language prohibiting variances if they jeopardize continued existence of any threatened or endangered species or result in unreasonable risk to human health. This language is not included in the federal rule. Any variance for an aquatic life criterion would require consultation under the Endangered Species Act and thus, would not be approved by EPA if it would jeopardize threatened or endangered species. Moreover, variances are intended to reduce pollutant loads over time, decreasing any potential risk to human health. Finally, any discharger still has to comply with technology-based limits irrespective of whether there is a variance, further ensuring removal of pollutants to the extent feasible.

- The proposed rule removes language that prohibits variances if the point source does not have a currently effective NDPES permit, as it is not included in the federal rule. There may be instances where a new facility or activity should be able to obtain a variance. The proposed language allows the director or the commission to issue a variance to a new discharger if conditions required by the variance rule are met.
- The proposed rule removes language prohibiting variances if information provided by a discharger does not allow DEQ or the commission to conclude that an appropriate condition for a variance has been met. This language is not in federal rule and is redundant with the requirement that DEQ provide sufficient justification for the variance.

4. **Conditions to grant a variance.**

- The proposed rule amends the statement that "No existing use will be impaired or removed as a result of granting the variance," with the statement that "the requirements that apply throughout the term of the variance will not result in the lowering of currently attained ambient water quality." This language is consistent with federal requirements. DEQ's antidegradation policy also requires that permit requirements, including those associated with variances, protect existing uses.
- The proposed rule allows a variance for restoration activities, consistent with federal requirements.

5. **Variance Duration**

- The proposed rule changes requirements regarding the variance term to be consistent with federal requirements. Specifically, the proposed rule notes that the term of the variance may only be as long as necessary to meet the highest attainable condition (see #6 below). In addition, DEQ must re-evaluate the highest attainable condition at least every five years for variances longer than five years in duration and that DEQ submit this re-evaluation to EPA. Finally, the proposed rule states that if this re-evaluation is not completed, the variance will no longer be the applicable water quality standard.
- The proposed rule removes language regarding administrative extension of permits with variance-related requirements. This language is redundant with general practice for all permits and is therefore unnecessary.
- The proposed rule removes language that would prioritize permit renewals for permits containing variances. There are many reasons why DEQ would prioritize one permit over another, such as settlement agreements and prioritizing permits that have been administratively extended. The new rule allows variances for longer than a permit cycle with requirements for pollutant minimization plans that cover the term of the variance. As a result, this provision has limited impact related to DEQ's efforts for timely permit renewal.

6. **Variance Submittal Requirements.** The proposed rule clarifies variance submittal requirements to differentiate requirements for individual, multiple discharger and waterbody variances, as follows:

- The current rule includes requirements for individual variances only. The proposed rule no longer requires applicants for individual variances to submit information about cost-effective and reasonable best management practices for nonpoint sources under the control of the discharger that addresses the pollutant the variance is based upon. This language is not required under federal rule for discharger-specific variances. The

(b) (5)

proposed rule also only requires a pollutant minimization plan if it is required by the expression of the highest attainable condition under the variance. This is consistent with federal rules.

- The proposed rule notes that submittal requirements for multiple discharger and waterbody variances will be noted in the rule for these variances. In addition, for waterbody variances, the rule requires that an applicant identify and document any cost- effective and reasonable best management practices for nonpoint source controls related to the variance, as required by federal rule.

7. **Highest Attainable Condition.** The proposed rules adopt, verbatim, federal variance rule language describing the Highest Attainable Condition. The HAC provides the best condition that is achievable in the waterbody or by the discharger or dischargers covered by the variance. According to federal rules, the HAC may be expressed in one of three ways for discharger- specific variances:
   - The first HAC expression way is called the "highest attainable interim criterion," which is a pollutant level that can be achieved in the waterbody or waterbodies. This HAC expression is useful if there is a high level of certainty of the pollutant level that the waterbody can achieve at the end of the variance.
   - The second HAC expression is called the "interim effluent condition reflecting the greatest pollutant reduction achievable." This expression is useful if a discharger will undergo treatment upgrades under the variance and there is enough information to determine what pollutant levels a discharger can achieve once the upgrade is operating.
   - The third HAC expression is allowed if there is no additional feasible pollutant control. In this instance, the HAC is "the interim criterion or interim effluent condition reflecting greatest pollutant reduction with optimization of installed treatment and adoption and implementation of a pollutant minimization plan." In short, this means that a discharger is required to maintain current, optimized treatment and implement a PMP in order to make incremental progress toward the water quality standard.

(b) (5)

8. **Permit Conditions**
   - The proposed rule amendments state that permit conditions shall be based on theHAC specified by the variance, in accordance with federal rules.
   - The proposed rules remove the requirement that permit limits be concentration-based. This amendment will allow mass-based permit limits, where appropriate.
   - The proposed rules remove a requirement that the interim permit

limit be based on discharge monitoring data. In some cases, the highest attainable condition may be based on a treatment upgrade and, therefore, may reflect a desired future condition, rather than a condition based on past performance data.

9. **Public Notification Requirements.** The proposed rule clarifies public notification requirements to ensure that public notice for a variance is separate from public notice for a permit, although this notification may be coordinated and concurrent for administrative efficiency.

10. **Variance Renewals.** The proposed rules remove a section regarding variance renewals because federal rules require that DEQ grant a new variance if an existing variance expires. As a result, this section is unnecessary.